Electronic Version
Stylesheet Version v1.1.1

Claims

[c1] 1. A 2-terminal re-writable memory cell, comprising:

a non-linear resistive memory element that can store non-volatile information;

wherein

the resistance of the non-linear resistive memory element can be reversibly written to different values, whereby the resistance of the non-linear resistive memory is used to determine the stored information; and

the memory cell is accessed through exactly 2 terminals.

[c2] 2. The 2-terminal re-writable memory cell of claim 1, wherein the non-linear resistive memory element includes a conductive metal oxide.

[c3] 3. The 2-terminal re-writable memory cell of claim 2, wherein the non-linear resistive element includes at least one electrode that interfaces with the conductive metal oxide.

[c4] 4. The 2-terminal re-writable memory cell of claim 3,

wherein the non-linearity is induced at the interface between at least one electrode and the conductive metal oxide.

[c5] 5. The 2-terminal re-writable memory cell of claim 4, wherein the non-linear resistive element includes two electrodes that interface with the conductive metal oxide and the non-linearity is induced at the interfaces between electrodes and the conductive metal oxide.

[c6] 6. The 2-terminal re-writable memory cell of claim 1, wherein the non-linearity resistive element includes a resistive memory material and a non-linear device in series.

[c7] 7. The 2-terminal re-writable memory cell of claim 6, wherein the non-linear device includes two backward diodes back to back.

[c8] 8. A re-writable memory comprising:

a plurality of x-direction conductive lines, each conductive line being patterned in a first direction;

a plurality of y-direction conductive lines, each conductive line being patterned in a second direction orthogonal to the first direction;

a plurality of memory cells, each memory cell being accessible for reading or writing through selection of

an x-direction conductive line and a y-direction conductive line;

wherein

a memory cell is located at or near the intersection of the selected x-direction conductive array line and the selected y-direction conductive array line; and

the memory cells include a non-linear resistive element.

[c9] 9. The re-writable memory of claim 8, wherein:

the non-linear resistive element includes a resistive memory element and a non-ohmic device in series.

[c10] 10. The re-writable memory of claim 9, wherein:

the non-ohmic device includes two backward diodes back to back.

[c11] 11. The re-writable memory of claim 8, wherein:

the non-linear resistive memory element includes a conductive metal oxide and at least one electrode.

[c12] 12. The re-writable memory of claim 11, wherein:

the non-linear resistive memory element includes a conductive metal oxide and two electrodes.

[c13] 13. A memory cell comprising:

a bottom electrode;

a top electrode; and

at least one conductive metal oxide sandwiched in-between the bottom and top electrodes;

wherein the memory cell exhibits a non-linear IV characteristic between the top and bottom electrodes.

[c14] 14. The memory cell of claim 13, wherein:

the write threshold of the memory element is fabricated to match the non-linear IV characteristic of the memory cell.

[c15] 15. The memory cell of claim 14, wherein:

the write threshold of the memory element is less than the non-ohmic voltage of the memory cell.

[c16] 16. A memory cell, comprising:

a first terminal that is capable of being placed at a first voltage potential;

a non-linear device that is electrically coupled to the first terminal;

a non-volatile resistive memory element that is electrically coupled to the non-linear device; and

a second terminal that is capable of being placed at a second voltage potential and is electrically coupled to the non-volatile resistive memory element;

wherein the resistance of the non-volatile resistive memory element can be reversibly written to different values, whereby the resistance of the non-volatile resistive memory is used to determine the stored information.

[c17] 17. The memory cell of claim 16, wherein:
the non-linear device includes an electrode that interfaces with the non-volatile memory element, such that the non-linearity is induced at the interface between at least one electrode and the conductive metal oxide.

[c18] 18. The memory cell of claim 16, wherein:
the non-linear device includes two backward diodes in opposite directions and in series.